

"Hip resurfacing clamp"Cross-Reference to Related Applications

The present application claims priority from Australian Provisional Patent Application No 2006902849, filed 26 May 2006 and Australian Provisional Patent
5 Application No 2006906747 filed on 1 December 2006, the contents of which are incorporated herein by reference.

This invention relates to a hip resurfacing guide and relates particularly to a guide which is used during hip surgery, and specifically resurfacing surgery.

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Hip replacement surgical techniques typically involve replacing the femoral head and acetabulum with prosthetics. The surgery involves osteotomising the femoral head and cementing a prosthetic head and shaft to the femur, inserting a prosthetic acetabular cup into a reamed acetabulum, and engaging the prosthetic head into the prosthetic cup.

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Alternatively, in total hip resurfacing operations, the surgeon removes only the diseased or damaged surfaces of the head of the femur and the hip socket (acetabulum). The femoral head may be fitted with a spherical metal shell and the hip socket lined with a thin spherical metal cup. Total hip resurfacing has been investigated in a broader range
20 of patients including those with osteoarthritis, rheumatoid arthritis, and advanced avascular necrosis. It has been proposed as an alternative to total hip arthroplasty, particularly in young active patients who would potentially outlive a total hip prosthesis. Therefore, total hip resurfacing could be used to delay the need for a total hip arthroplasty.

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Proposed advantages of total hip resurfacing compared to total hip arthroplasty include preservation of the femoral neck and femoral canal, thus facilitating revision or conversion to a total hip replacement, if required. In addition, the resurfaced head is more similar in size to the normal femoral head, thus increasing the stability and
30 decreasing the risk of dislocation compared to total hip arthroplasty.

In total hip resurfacing, the femoral head of the patient may be reshaped and reengaged with a prosthetic acetabula cup of appropriate size. With this arrangement, the head of the femur must be accurately resurfaced, and for this purpose, it is essential to locate
35 the centre of the femoral head to facilitate reshaping.

Accordingly, it is desired to provide a guide to facilitate resurfacing surgery.

It is also desirable to provide a guide to facilitate location of the centre of a femoral head or to find a parallel centreline to the bottom surface of the femoral neck to thereby
5 enable accurate resurfacing to occur.

It is also desirable to provide a guide which is able to be used in hip resurfacing surgery conducted through a relatively minor incision in the patient.

10 It is also desirable to provide a guide clamp adapted to engage a femoral neck to position a guide in relation to the head.

In a first aspect the invention provides a guide for hip resurfacing and similar surgery comprising at least two arms adapted to engage the femoral neck of a femur and a
15 guide stem adapted to cooperate with said arms such that the adjustment of said arms or fittings thereto clamps said guide onto said femoral neck and positions said guide stem centrally at the femoral head of said femur and allows a punch, drill or other tool to work at a precise central orientation to said femoral head.

20 In accordance with another aspect of the invention there is provided a guide for hip resurfacing and similar surgery comprising a plurality of pivoted arms mounted to a transverse arm carrier, each arm having an outer end portion and a curved, inner end portion terminating at an engagement surface, the pivotal connection with said arm carrier being inwardly spaced from the outer end portion, a central boss cooperating
25 with said arm carrier to which the arms are respectively pivoted for movement about axes perpendicular to the boss axis, a guide stem extending axially from the boss, a threaded actuator threadably engaged with the guide stem for relative rotational and corresponding axial movement, an actuating surface on the actuator engageable by each arm outer end portion whereby axial movement of the actuator moves the arm inner
30 end portions towards and away from the axis of said guide.

In one form of the invention, four arms are equally spaced about the axis of the guide.

In another embodiment, three arms are equally spaced about the axis of the guide.
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Preferably, the guide stem is adapted to receive and guide a punch or a cannulated drill.

The actuating surface on the actuator is preferably of frustro-conical shape such that axial movement of the actuator away from the boss causes the engaged outer end portion of each arm to move radially outwardly about the pivot thereby moving the arm inner end portions radially inwardly. In one form, the arms are biased into engagement with the actuating surface.

The actuator may include a ring to facilitate rotation of the actuator.

In use, the guide is clamped to a femoral neck such that the femoral head is located within the space defined by the plurality of arms. The adjuster is used to ensure that the engagement surface of each arm engages with the surface of the femoral neck and that the boss and guide stem is accurately supported in relation to the femoral head. A drill may then be used to drill through the femoral head, if necessary to the centre of the neck. Once the hole is drilled, the guide clamp can be removed and the drill hole may then be used as a guide for resurfacing the femoral head.

Alternatively, a punch may be used to mark a central location on the femoral head for locating re-shaping tools.

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In accordance with another aspect of the invention there is provided a guide for hip resurfacing and similar surgery comprising a body carrying a plurality of arms, at least a first one of which is pivoted to the body and a second of which is either fixed to the body, or is adjustably mounted on the body as is adapted to be fixed relative thereto in a selected relative position, at least said first arm having an engagement member at its free end adapted to engage a femoral neck, at least said second arm having a curved portion terminating at an engagement pad adapted to engage an opposite side of the femoral neck, a threaded nut rotatably mounted on the body, a threaded guide engaged with the threaded nut such that rotation of the nut moves the guide axially relative to the body, an actuator arm fixed to an inner end of the guide, the actuator arm extending generally radially outwardly towards the at least said first arm to engage therewith whereby axial movement of the threaded guide and actuator arm causes the said first arm to move about its pivotal mounting to thereby move the engagement member towards or away from the engagement pad on at least said second arm.

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In one particular form, one pivoted arm is mounted to the body on one side thereof and a fixed arm extends from the opposite side of the body.

Preferably, the threaded nut comprises a rotatable wheel threadably engaged with the
5 axially moveable guide.

Preferably, the guide has a bore therethrough to receive a cannulated drill, a punch or other device whereby, when engaged with a femoral head, the inner end of the guide bore provides an indication of the centre of the femoral head.

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In one preferred embodiment, the pivoted first arm includes a portion formed as a slide which is engaged by a pin on the actuator arm whereby axial movement of the pin translates to pivotal movement of the arm.

15 Preferably, the engagement member comprises two spaced fingers extending from the end of the said first arm and adapted to engage spaced points on a femoral neck. The fingers may be mounted for pivotal movement relative to the arm to facilitate alignment thereof when engaged with a femoral neck.

20 Preferably, the engagement pad may be adjustable by engaging spacer members thereto whereby the pad thickness may be changed to adjust four different sizes of femoral neck.

In another aspect the invention provides a guide for hip resurfacing and similar surgery
25 comprising a body having a first engagement surface at one end thereof adapted to engage a surface of a femur,

a rocker pivotally and adjustably connected to the other end of the body whereby the rocker position and orientation relative to the body is adjustable,

the rocker having a second engagement surface at a forward end adapted
30 to engage a second surface of the femur on a side of the femur spaced from the first surface,

a third engagement surface at a rearward end of the rocker and adapted to engage the femur adjacent the femoral head generally longitudinally spaced from the second surface,

a location indicator to indicate, in use, the rocker orientation relative to the body, and

a guide stem on the body.

- 5 The guide body may include one or more arms defining a generally C-shaped structure. In one form, a single arm carries the first engagement surface. In another form, a pair of spaced arms have engagement surfaces at their ends which, together, define the first engagement surface.
- 10 The rocker may be connected to the body by a threaded stem carrying the pivotal mounting at an inner end thereof whereby the pivotal mounting can be adjusted relative to the other end of the body.

The axis of the pivotal connection of the rocker to the body may be substantially at right angles to the femur axis. The rocker, therefore, is able to move (rock) about the pivot and using the second engagement surface as a fulcrum to thereby move the third engagement surface towards and away from the femur.

15

The location indicator may include a projection extending from the rocker towards the body. The relative location of the projection and body provides an indication of the rocker orientation. In one form, the projection engages through a slot in the body.

20

The guide stem may be adjustably mounted relative to the body for movement along the body. The guide stem may also be adjustable for movement towards and away from a femoral head engaged by the guide. The guide stem preferably includes a cannula through which a drill, marker, scribe or other instrument may be passed to engage the femoral head at the desired location.

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The first engagement surface may be V-shaped in order to provide a centering and/or alignment function when the surface engages the femur. Similarly, the rearward end of the rocker may have a V-shaped third engagement surface to assist in centering and alignment of the rocker. The forward engagement or second surface is preferably planar, or even convex, to provide a fulcrum for the rocker during adjustment.

30

In use, the guide is attached to the femur at or adjacent the femoral neck such that the femoral head is located adjacent the guide stem. The first engagement surface is engaged with the inner surface of the femoral neck while the rocker is disposed adjacent the greater trochanter. The rocker, which extends generally in the longitudinal direction relative to the femur, engages the second surface of the femur on the side of the greater trochanter and extends rearwardly therefrom, towards the femoral head, so that the third engagement surface engages the femoral neck. The first and third engagement surfaces are preferably V-shaped so that the guide is properly aligned relative to the femur.

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The projection extending from the rearward end of the rocker passes through a slot in the upper arm of the body, and the rocker adjustment means is adjusted so that the projection is substantially centralised within the slot. In this position, the guide stem may be moved relative to the body so that the end of the stem engages the femoral head at the rearmost position. A drill may then be used through the cannula in the guide stem to drill into the femoral head at the appropriate location. Alternatively, a punch, scribe or other device may be used to mark the central location on the femoral head for locating reshaping tools or the like.

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20 In order that the invention is more readily understood, embodiments thereof will now be described with reference to the accompanying drawings and legend wherein:

Figure 1 is a perspective view of a guide clamp in accordance with one embodiment of the invention;

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Figure 2 is a side elevational view of a guide clamp of a second embodiment, in its operative position;

Figure 3 is a view along lines 33 of Figure 2 (excluding the femoral head);

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Figure 4 is a view similar to that of Figure 3 but of a guide clamp having three arms; and

Figure 5 is an end view of a boss of Figure 2 showing the arm carriers;

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Figure 6 is a perspective view of a second embodiment of a femoral neck clamp guide;

Figure 7 is a side elevational view of the clamp guide in use; and

5 Figure 8 illustrates an engagement pad and various spaces.

Figure 9 is a schematic elevational view of a guide in accordance with an alternative embodiment of the invention;

10 Figure 10 is an end elevational view of the guide of Figure 9;

Figure 11 is an end elevational view of an alternative embodiment of the invention; and

Figure 12 is a view along the lines 4-4 of Figure 9.

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Legend

- | | |
|-----|------------------------------------|
| 10. | Guide clamp |
| 12. | Pivoting arm |
| 14. | Arm carriers |
| 16. | Boss |
| 17. | Outer end portion |
| 18. | Semi-circular surface |
| 19. | Inner end portion |
| 21. | Engagement surface |
| 22. | Pivot point |
| 23. | Axial guide stem |
| 24. | Actuator |
| 26. | Frustro conical activating surface |
| 27. | Actuating ring |
| 29. | Femoral neck |
| 31. | Femoral head |
| 41. | Arm |
| 42. | Arm |
| 43. | Body |

- 44. Pivot
- 46. Wheel
- 47. Guide
- 48. Fingers
- 49. Ends
- 50. Femoral neck
- 51. Slide
- 52. Cam pin
- 53. Actuator arm
- 54. Pad
- 55. Bore
- 56. Inner surface
- 57. Spacers
- 58. Femoral head
- 62. Guide
- 64. Body
- 66. Upper arm
- 67. Lower arm
- 68. Engagement end
- 69. Upper surface
- 71. Femoral head
- 72. Threaded shaft
- 73. Thumbwheel
- 74. Ferrule
- 76. Rocker
- 77. Pivot
- 78. Femur
- 79. Forward end
- 80. Foot
- 81. Greater trochanter
- 82. Rear end
- 83. Leg
- 84. Femoral neck
- 86. Pin (location indicator projection)

- 87. Slot
- 88. Guide stem
- 89. Slot
- 91. Nuts
- 92. Wheel

Referring to the drawings and legend, Figure 1 illustrates a guide clamp for hip resurfacing surgery in accordance with one embodiment of the invention. The guide clamp of Figure 1 has a pair of opposed pivoted arms whereas the guide clamp of
5 Figures 2, 3 and 5 has four pivoted arms. The guide clamps of these embodiments are substantially identical in all other respects.

The pivoted arms 12 are carried on arm carriers 14 extending radially from a boss 16 forming the body of the guide clamp 10.

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Each pivoted arm 12 has an outer end portion 17 which includes, at its outermost end, a substantially semi-circular surface 18. Each pivoted arm 12 also includes an inner end portion 19 terminating at an engagement surface 21. As shown in Figures 1 and 2, each pivoted arm 12 is pivoted to the respective arm carrier 14 at a pivot point 22 inwardly
15 spaced from the outer end portion 17.

The boss 16 has an outwardly extending, axial guide stem 23. The guide stem has an external thread to threadably receive an actuator 24. The actuator 24 includes a substantially frusto conical actuating surface 26 which is adapted to be engaged by the
20 semi-circular surfaces 18 on the outer end portions 17 of each arm 12. The actuator 24 further includes an actuating ring 27 which may have a knurled outer surface or the like to facilitate relative rotation of the actuator 24.

In use, rotation of the actuator 24 causes corresponding axial movement of the
25 actuating surface 26 relative to the arm carriers 14 whereby the semi-circular surfaces 18 move radially relative to the actuating surface 26. Such radial movement of the outer end portion 17 of each arm 12 causes the corresponding inner end portion 19 to move radially inwardly towards the axis of the boss 16.

30 As particularly shown in Figure 2, such radial inward movement of the inner end arm portions 19 causes the engagement surfaces 21 to engage about a femoral neck 29

whilst the femoral head 31 is positioned in the space defined by the curved arms 12. Rotation of the ring 27 ensures that the respective engagement surfaces 21 are positively and firmly engaged with the surface of the femoral neck 29. In this way, the boss 16 is accurately positioned along the centre line, or axis, of the femur neck.

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The guide stem 23 is hollow and is adapted to receive either a punch, as shown in Figure 1, or, more preferably, a cannulated drill so as to be able to drill a hole through the femoral head 31 to the centre of the femoral neck 29. The guide stem 23 and integral boss 16 is accurately maintained in position by the engagement of the actuating surface 26 with the semicircular surfaces 18 on the outer end portions 17 of each arm 12. Once the appropriate hole is drilled, the guide clamp may be removed from engagement with the femoral neck and the drilled hole then used to facilitate resurface of the femoral head.

15 The embodiments of Figures 2, 3 and 5 show a guide clamp 10 having four pivoted arms 12 to locate the body axis relative to the femoral head 31. In Figure 4, a modified embodiment is shown with three pivoted arms 12 equally spaced about the axis of the guide clamp 10.

20 Referring to Figures 6 to 8, a second embodiment of a femoral neck clamp guide is shown in which two arms 41 and 42 extend from a body 43. The arm 41 is pivotally mounted to the body 43 by the pivot pin 44 whereas the arm 42 is fixed to the body, extending therefrom opposite the arm 41.

25 The body 43 carries a rotatable wheel 46 having an internal thread which engages with the external thread on the axially moveable guide 47. Thus, rotation of the wheel 46 causes the guide 47 to move axially through the body 43.

The pivoted arm 41 has a pair of transversely extending fingers 48 mounted on the free end of the arm 41. The fingers 48 are able to move about the axis of the connection of the fingers 48 to the arm 41 whereby the ends 49 of the fingers 48, which are adapted to engage spaced points on a femoral neck, in use, are able to move laterally to ensure alignment with an asymmetric femoral neck structure.

35 The pivoted arm 41 includes a slide 51 with which is engaged a cam pin 52 mounted of an end of an actuator arm 53. The actuator arm is fixed to the end of the axially

moveable guide 47. Thus, as the guide 47 moves axially relative to the body, the cam pin 52 slides along the side walls of the slide 51 causing the pivoted arm 41 to pivot about the pivot pin 44 axis such that the fingers 48 move laterally relative to the guide axis.

5

The fixed arm 42 is curved so as to fit around a femoral head, in use. The fixed arm 42 terminates at an engagement pad 54 which, as shown in Figure 8, has a curved inner surface 56 adapted to engage the surface of a femoral neck substantially opposite the engagement of the finger tips 49. However, the engagement pad 54 is axially spaced
10 from the actuator arm 53 a greater distance than the fingers 48 to ensure that the engagement pad engages the appropriate portion of the femoral neck.

In order to adapt the clamp guide for use with femoral necks of different sizes, a plurality of spacers 57 are adapted to slide onto the engagement pad 54. Five spacers,
15 ranging from 1mm to 5mm are illustrated in Figure 8, although spaces of other dimensions may also be used.

In use, the rotatable wheel 46 is rotated relative to the body to which it is connected so as to move the guide 47 axially outwardly, away from the engagement pad 54. This
20 causes the cam pin 52 to move along the slide 51, towards the pivot pin 44, thereby causing the pivoted arm 41 to move outwardly, away from the guide axis. This outward movement spaces the fingers 48 from the engagement pad 54 a distance sufficient to enable the fingers and pad to engage over a femoral head. The wheel 46 is then rotated in the opposite direction to move the actuator arm 53 towards the femoral
25 head 58 thereby moving the pivoted arm 41 so that the fingertips 49 contact spaced points on the femoral neck 50. At the same time, the engagement pad 54 engages the opposite side of the femoral neck 50 as the inner end of the guide 47 contacts the femoral head 58. The contact points thereby locate the centre of the femoral head 58, or a line parallel to the bottom surface of the femoral neck, so that a cannulated drill, a
30 punch or other marking device may be engaged through a bore 55 in the guide to thereby mark or drill into the femoral head 58 at the centre or on the line parallel to the bottom surface of the femoral neck as determined by the guide clamp.

Referring now to Figures 9 and 10, in an alternative embodiment the guide 62
35 comprises a body 64 formed with an upper arm 66 and a lower arm 67, the arms defining a generally C-shaped structure.

The lower arm 67 has, at its outer end, an engagement end 68 which has a V-shaped upper surface 69 (Figure 12).

- 5 The upper arm 66 carries a threaded shaft 72 having a thumbwheel 73 by which the shaft may be rotated relative to the upper arm 66. The lower end of the threaded shaft 72 supports a ferrul 74 to which is pivotally mounted a rocker 76. The axis of the pivot 77 extends substantially at right angles to the axis of the femur 78, and the rocker 76 is adapted to pivot relative to the femur 78.

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A forward end 79 of the rocker 76 has a foot 80 to engage the upper surface of the greater trochanter 81. The rear end 82 of the rocker 76 has a downwardly extending leg 83 the lower end of which is of inverted V-shape so as to assist in centralising and aligning the rocker relative to the femoral neck 84. The relative positions of the foot 80
15 and lower end of the leg 83 together with the threaded location of the shaft 72 determines the angular orientation of the rocker 76.

A pin 86 extends upwardly from the rocker 76 and passes through a slot 87 formed in the upper arm 66. The location of the pin 86 relative to the slot 87 stops the rocker
20 from rotating relative to the body.

The body 64 carries a hollow, threaded, adjustable guide stem 88. The guide stem engages through a slot 89 and is held in position by a pair of nuts 91 engaged on each side of the stem 88. The position of the guide stem 88 relative to the body 64 may be
25 varied by rotating the knurled wheel 92 to rotate the threaded guide stem 88 to thereby move the guide stem 88 towards or away from the femoral head 71.

With the guide 62 in position, with the engagement end 68 engaged with the lower surface of the femoral neck 84 and with the rocker 76 positioned so that the foot 80
30 engages the greater trochanter 81 while the lower end of the leg 83 engages the upper surface of the femoral neck 84, and the pin 86 is centrally located within the slot 87, the guide stem 88 may be adjusted to engage the rearmost surface of the femoral head 71. A drill or punch or the like 93 may be guided through the hollow guide stem 88 to drill

or otherwise mark the central location of the femoral head as determined by the guide 62.

Referring to Figure 11, in a modification of the invention, the body 64 has a pair of
5 lower arms 67a and 67b each having an engagement in 68a and 68b which, together, defines spaced surfaces to locate the lower surface of the femoral neck 84.

It will be appreciated that the body 64 may take a number of different forms to connect the engagement surfaces of the rocker with those engagement surfaces which engage
10 the lower portion of the femoral neck. By providing a rocker, which rocks about its pivotal connection to an adjusting screw, the correct location of the body relative to the femoral head can be accurately determined. The rocker is maintained in its correct longitudinal position by the pin engaging through the slot in the upper arm such that the foot 80 on the forward end of the rocker is able to act as a fulcrum for the rocker when
15 the threaded shaft 72 is rotated to adjust the body to the correct position when the lower end of the leg 83 engages with the femoral neck 84.

It will be appreciated that the guide clamp of the present invention may be adapted for use in resurfacing a femoral head adapted to be fitted within a prosthetic acetabula cup,
20 with an appropriate liner. In this case, the guide clamp of the invention ensures that a guide for drilling may be attached to the clamp or incorporated into the clamp when the arms lock onto the femur neck.

In modifications of the invention, the drilling guide may be removably attached to the
25 guide stem extending from the clamp boss.

It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The
30 present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

CLAIMS:

1. A guide for hip resurfacing and similar surgery comprising a plurality of pivoted arms mounted to a transverse arm carrier, each arm having an outer end portion and a curved inner end portion terminating at an engagement surface, a central boss
5 cooperating with said arm carrier to which said arms are respectively pivoted for movement about axis perpendicular to the boss axis, said arm pivotal connection with said arm carrier being inwardly spaced from said outer end portion, a guide stem extending axially from said boss, a threaded actuator threadably engaged with said guide stem for relative rotational and corresponding axial movement, an actuating
10 surface on said actuator engagable by each arm outer end portion whereby axial movement of said actuator moves said arm inner portions toward and away from the axis of said guide.
2. A guide according to claim 1, including four arms equally spaced about the axis
15 of said guide.
3. A guide according to claim 1, including three arms equally spaced about the axis of said guide.
- 20 4. A guide according to any one of claims 1 to 3, wherein said guide stem is adapted to receive and guide a punch or cannulated drill.
5. A guide according to any one of claims 1 to 5, where said actuating surface on said actuator is of a frustro conical shape such that axial movement of said actuator
25 away from said boss causes the engaged outer end portion of each arm to move radially outwardly about the pivot thereby moving said arm inner portions radially inward.
6. A guide according to any one of claims 1 to 5, wherein said arms are biased into engagement with said actuating surface.
30
7. A guide according to any one of claims 1 to 6, wherein said actuator includes a ring to facilitate rotation of said actuator.
8. A guide for hip resurfacing and similar surgery comprising a body carrying a
35 plurality of arms, at least a first one of which is pivoted to the body and a second of which is either fixed to the body, or is adjustably mounted on the body as is adapted to

be fixed relative thereto in a selected relative position, at least said first arm having an engagement member at its free end adapted to engage a femoral neck, at least said second arm having a curved portion terminating at an engagement pad adapted to engage an opposite side of the femoral neck, a threaded nut rotatably mounted on the
5 body, a threaded guide engaged with the threaded nut such that rotation of the nut moves the guide axially relative to the body, an actuator arm fixed to an inner end of the guide, the actuator arm extending generally radially outwardly towards the at least said first arm to engage therewith whereby axial movement of the threaded guide and
10 move the engagement member towards or away from the engagement pad on at least said second arm.

9. A guide according to claim 8, wherein said pivoted arm is mounted to a first side thereof and said fixed arm extends from a second opposite side of said body.
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10. A guide according to claim 8 or 9, wherein said threaded nut comprises a rotatable wheel threadably engaged with said axially moveable guide.

11. A guide according to any one of claims 8 to 10, wherein said guide includes a
20 centrally located bore to receive a cannulated drill, punch or similar device such that when said guide is engaged with a femoral head, said inner end of said guide bore provides an indication of the centre of said femoral head.

12. A guide according to any one of claims 8 to 11, wherein said pivoted first arm
25 includes a portion formed as a slide for engagement by a pin on said actuator arm whereby axial movement of said pin translates to pivotal movement of said arm.

13. A guide according to any one of claims 8 to 12 wherein said engagement
30 member comprises two spaced fingers extending from the end of the said first arm and adaptive to engage spaced points on a femoral neck.

14. A guide according to claim 13 wherein said fingers are mounted for pivotal
movement relative to said arm to facilitate alignment thereof when engaged with a
femoral neck.

15. A guide according to any one of claims 8 to 14 wherein said engagement pad is adjustable by engaging spacer members thereto whereby said pad thickness can be changed to adjust for different sizes to femoral neck.
- 5 16. A guide for hip resurfacing and similar surgery comprising a body having a first engagement surface at one end thereof adapted to engage a first surface or a femur, a rocker pivotally and adjustably connected to the other end of said body whereby the rocker position and orientation relative to said body is adjustable, the rocker having a second engagement surface at a forward end adapted to
10 engage a second surface of said femur on a side of the femur spaced from said first surface, a third engagement surface at a rearward end of the rocker and adapted to engage said femur adjacent the femoral head generally longitudinally spaced from said second surface,
15 a location indicator to indicate, in use, the rocker orientation relative to said body, and a guide stem on said body.
17. A guide according to claim 16 wherein said body includes one or more arms
20 defining a generally C-shaped structure.
18. A guide according to claim 17 wherein one of said arm carries said first engagement surface.
- 25 19. A guide according to claim 17 wherein a pair of said arms have engagement surfaces at their ends which combine to define said first engagement surface.
20. A guide according to any one of claims 16 to 19 wherein said rocker is connected to said body by a threaded stem carrying the pivotal mounting at an inner
30 end thereof whereby the pivotal mounting can be adjusted relative to said other end of the body.
21. A guide according to any one of claims 16 to 20 wherein the axis of pivotal connection of said rocker to said body is substantially at right angles to said femur axis.

22. A guide according to any one of claims 16 to 21 wherein said location indicator includes a projection extending from said rocker toward said body.
23. A guide according to any one of claims 16 to 22 wherein said guide stem is
5 adjustably mounted relative to said body for movement along said body.
24. A guide according to any one of claims 16 to 23 wherein said guide stem is adjustably mounted relative to said body for movement toward and away from said femoral head engaged by said guide.
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25. A guide according to any one of claims 16 to 24 wherein said guide stem includes a cannula through which a drill, marker, scribe or other instrument may be passed to engage said femoral head at a desired location.
- 15 26. A guide according to any one of claims 16 to 25 wherein said first engagement surface is V-shaped.
27. A guide according to any one of claims 16 to 26 wherein said third engagement surface is V-shaped.
20
28. A guide according to any one of claims 16 to 27 wherein the said second engagement surface of the rocker is planar or convex.
29. A guide according to any one of claims 1 to 28 substantially as hereinbefore
25 defined with reference to the figures.

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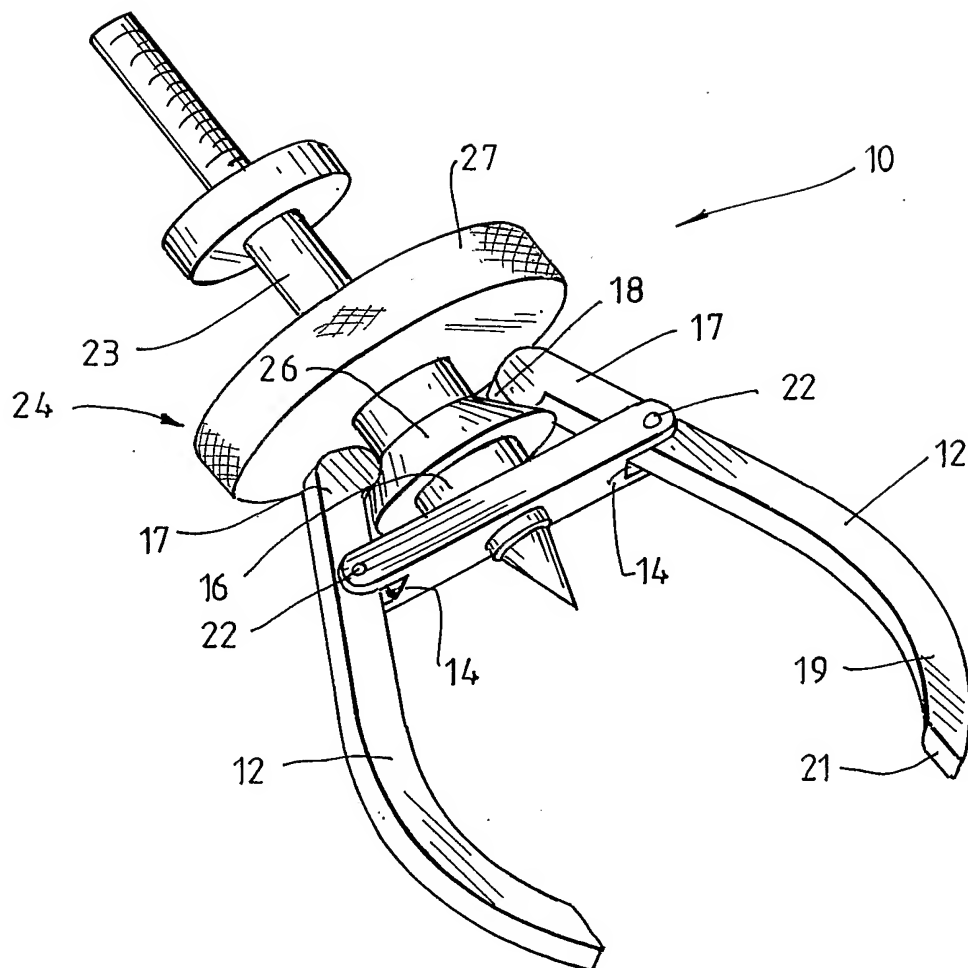


FIG. 1.

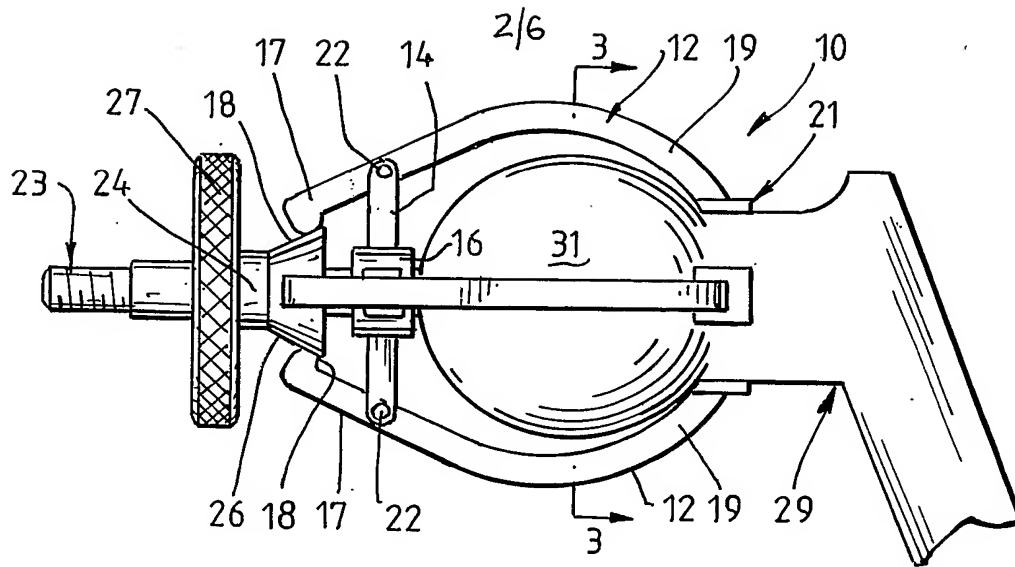


FIG. 2.

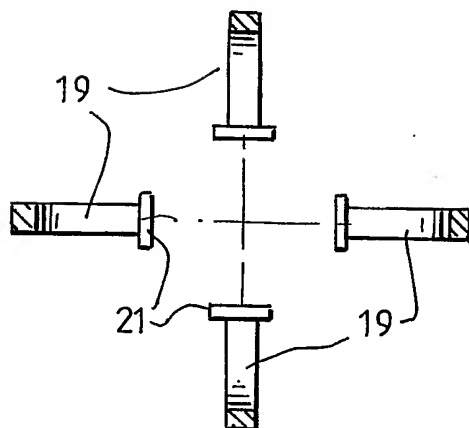


FIG. 3.

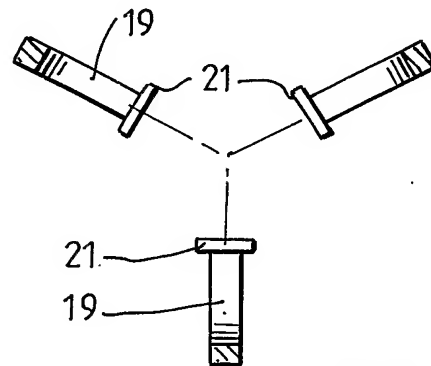


FIG. 4.

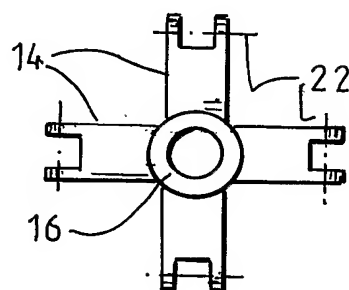
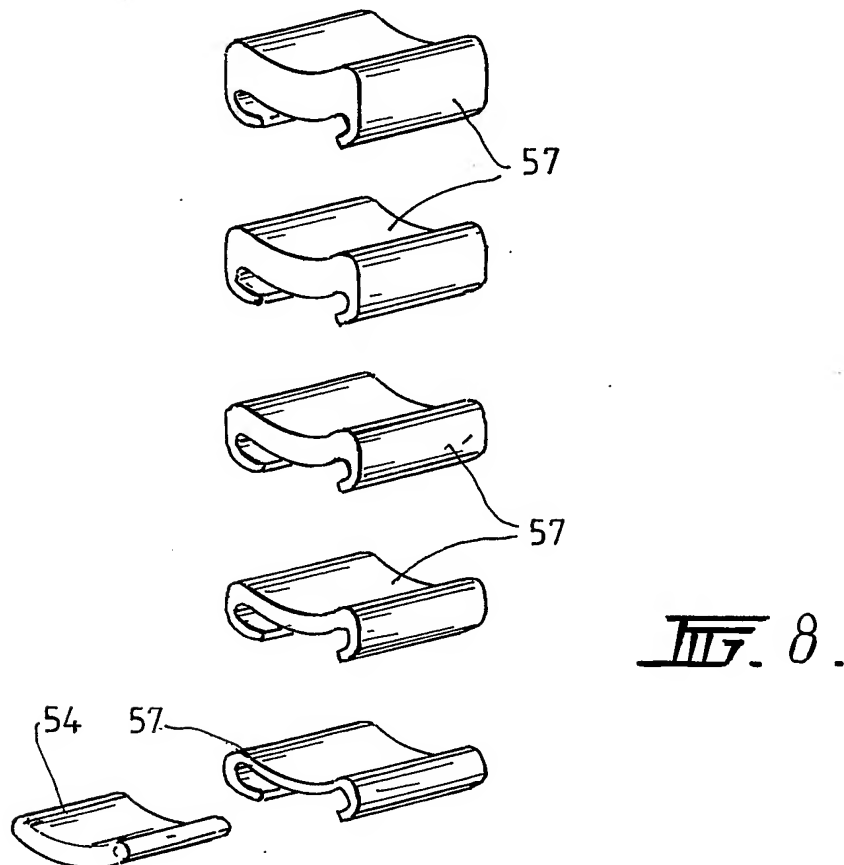
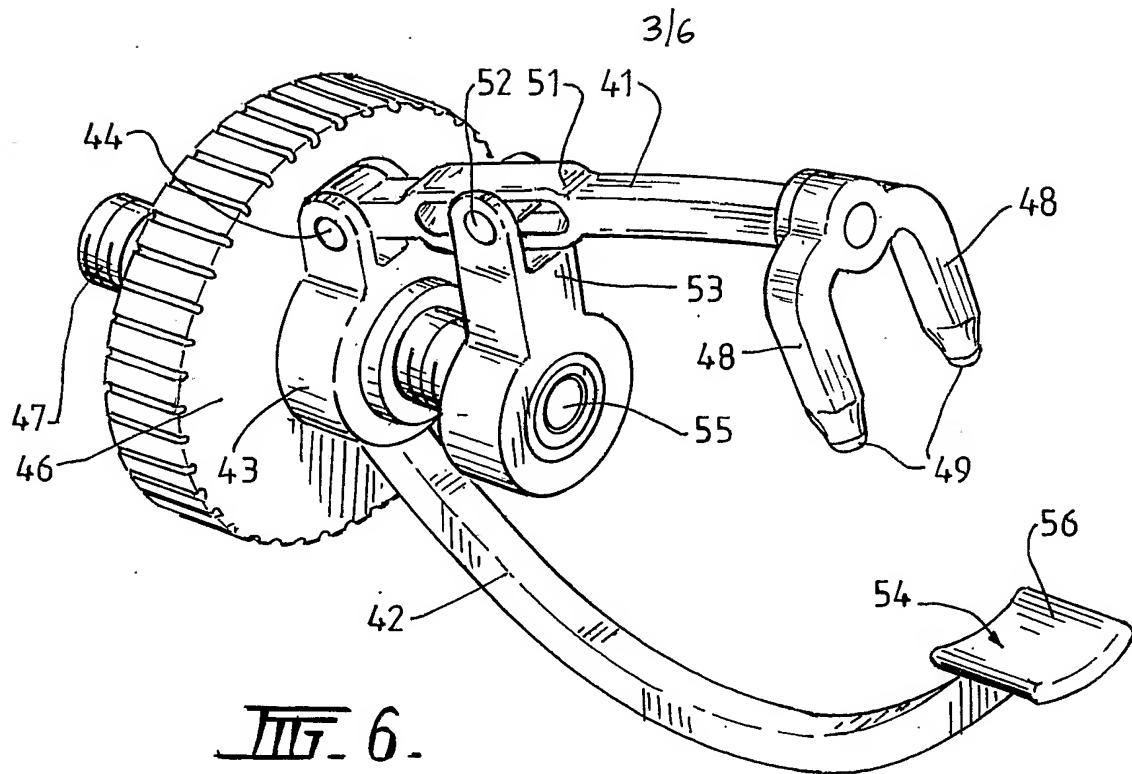
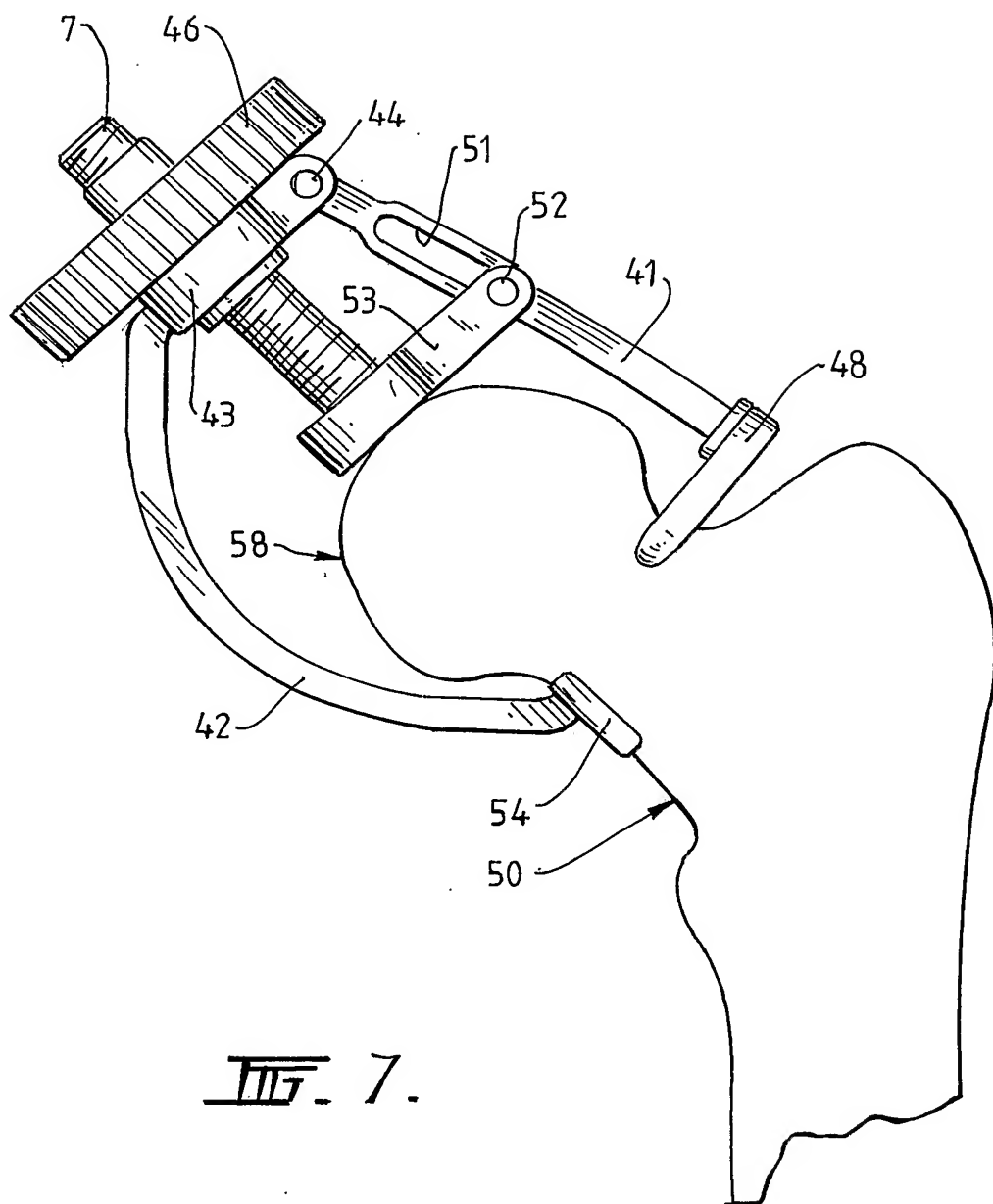


FIG. 5.



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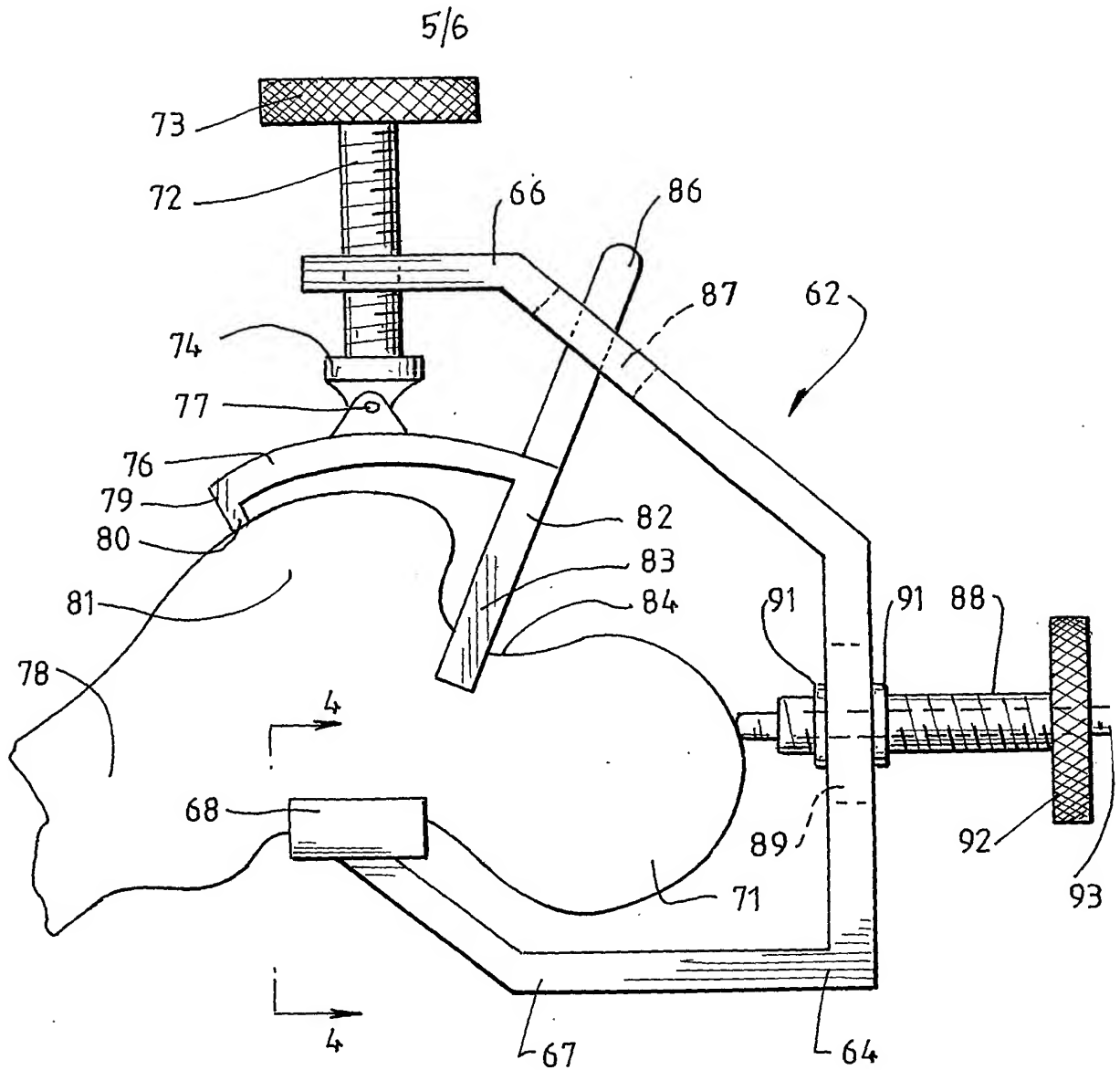


FIG. 9.

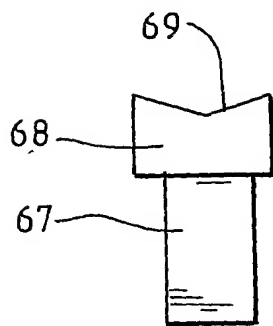
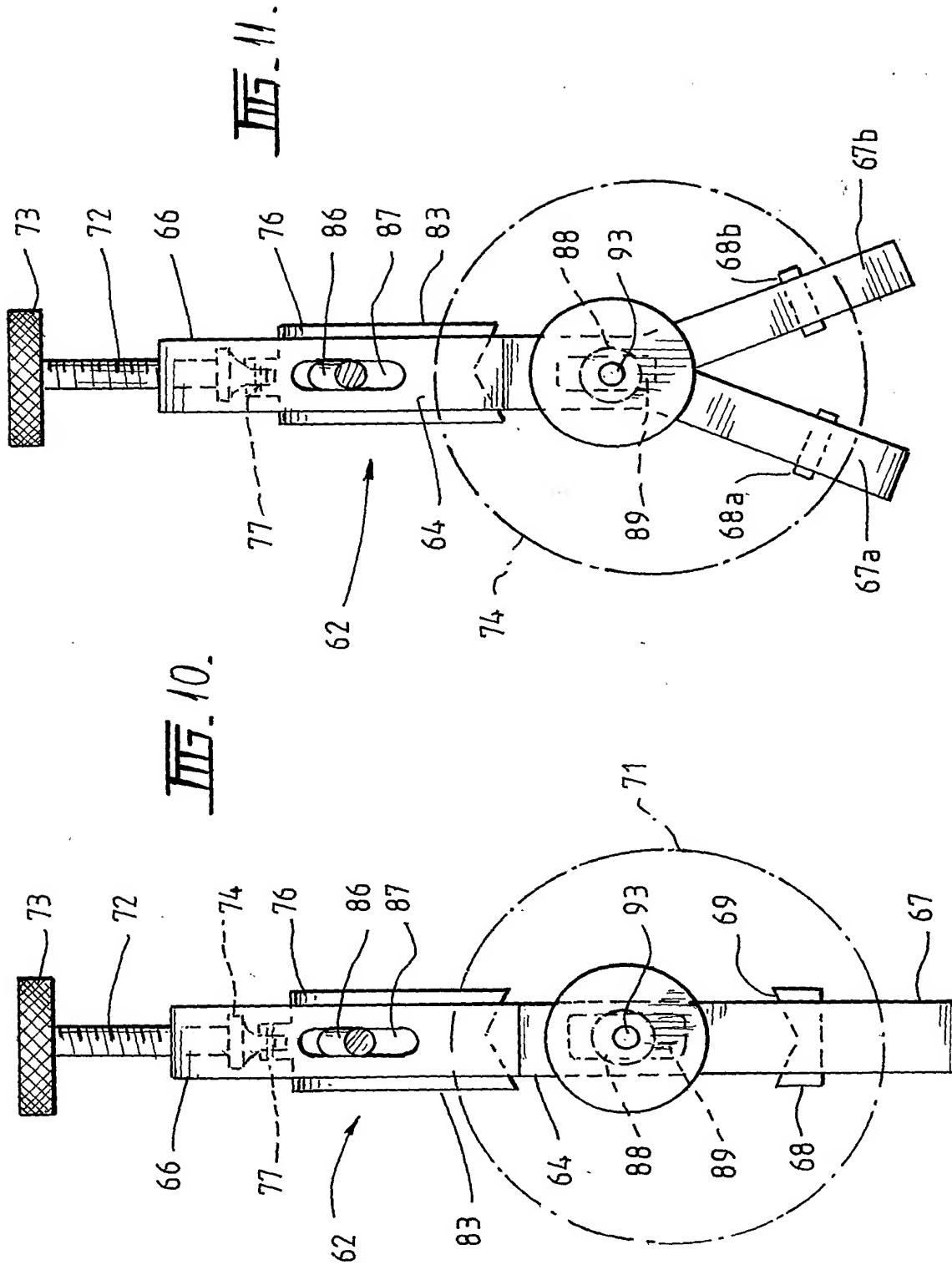


FIG. 12.

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INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

A61B 17/15 (2006.01) **A61B 17/17** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI: A61B 17/-, A61F 2/- and keywords: hip, femur, femoral, acetabular, resurfacing, reshape, revision, resection, guide, clamp, grip, locate, centre, arm, jaw, prong, pivot, punch, drill, thread, rotate; and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4896663 A (VANDEWALLS) 30 January 1990 See entire document	1-15, 29
X	US 5624444 A (WIXON et al.) 29 April 1997 See entire document	1-15, 29
X	EP 1588669 A1 (FINSBURY (DEVELOPMENT) LIMITED) 26 October 2005 See entire document	1-15, 29

☒ Further documents are listed in the continuation of Box C

☒ See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
09 July 2007

Date of mailing of the international search report
16 JUL 2007

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2007/000707

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005/0049714 A1 (CROFFORD)-3 March 2005 See entire document	
A	WO 2000/045721 A1 (NEW YORK SOCIETY FOR THE RUPTURED AND CRIPPPLED MAINTAINING THE HOSPITAL FOR SPECIAL SURGERY) 10 August 2000 See figures	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2007/000707

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

SEE EXTRA SHEET

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-15 and 29

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2007/000707

Supplemental Box

(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept.

In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

- Claims 1-7 and 29 (when appended to claim 1) directed to a guide for hip resurfacing. It is considered that a plurality of pivoted arms having an outer end portion and a curved inner end portion, whereby axial movement of the actuator moves said arm inner portions toward and away from the axis of the guide comprises a first distinguishing feature.
- Claims 8-15 and 29 (when appended to claim 8) directed to a guide for hip resurfacing. It is considered that a body carrying a plurality of arms, at least a first one of which is pivoted to the body and a second of which is either fixed to the body or is adjustably mounted on the body whereby axial movement of the actuator causes the first arm to move about its pivotal mounting to thereby move the engagement member toward or away from the engagement pad on at least the second arm comprises a second distinguishing feature.
- Claims 16-28 and 29 (when appended to claim 16) directed to a guide for hip resurfacing. It is considered that a rocker pivotally and adjustably connected to a body whereby the rocker position and orientation relative to the body is adjustable and a location indicator to indicate, in use, the rocker orientation relative to the body comprises a third distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

Each of the abovementioned groups of claims has a different distinguishing feature and they do not share any feature which could satisfy the requirement for being a special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a priori*.

NOTE: For the purposes of this report, the first and second inventions were searched together with negligible additional effort.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2007/000707

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member			
US	4896663				
US	5624444				
EP	1588669	EP	1588668	US	2005245934
		US	2006052876	US	2005245936
US	2005049714	AU	2003224886	CA	2522033
		US	6695883	US	7104995
		US	2004162621	US	2005010230
		WO	03086242	US	2005010232
		WO	2006020655		
WO	0045721	AU	28657/00	US	6159217
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.					
END OF ANNEX					